

**CLAIMS**

[1] A metal component characterized by comprising:  
a component main body; and  
5 a protective coating having oxidation resistance formed on  
a portion to be processed of the component main body,  
wherein the protective coating is formed by,  
employing an electrode composed of a molded body molded from  
mixed powders of one or more of an aluminum powder, an aluminum  
10 alloy powder, a chromium powder and a chromium alloy powder, or  
the molded body processed with a heat treatment, generating a  
pulsing electric discharge between the portion to be processed  
of the component main body and the electrode in an electrically  
insulating liquid or gas so that an electrode material of the  
15 electrode is adhered to the portion to be processed of the component  
main body by energy of the electric discharges, and keeping the  
portion to be processed of the component main body and the electrode  
material adhered thereto in high temperatures so that the electrode  
material adhered thereto diffuses into a base material of the  
20 component main body.

[2] A turbine component applied to a gas turbine engine, the  
turbine component characterized by comprising:  
a component main body; and  
25 a protective coating having oxidation resistance formed on  
a portion to be processed of the component main body,  
wherein the protective coating is formed by,  
employing an electrode composed of a molded body molded from  
mixed powders of one or more of an aluminum powder, an aluminum  
30 alloy powder, a chromium powder and a chromium alloy powder, or  
the molded body processed with a heat treatment, generating a  
pulsing electric discharge between the portion to be processed  
of the component main body and the electrode in an electrically  
insulating liquid or gas so that an electrode material of the  
35 electrode is adhered to the portion to be processed of the component  
main body by energy of the electric discharges, and keeping the  
portion to be processed of the component main body and the electrode

material adhered thereto in high temperatures so that the electrode material adhered thereto diffuses into a base material of the component main body.

5 [3] The turbine component recited in claim 2, characterized in that a surface side of the protective coating is processed with a peening treatment.

10 [4] A gas turbine engine characterized by comprising the turbine component recited in claim 2 or claim 3.

15 [5] A surface treatment method for a surface treatment with respect to a portion to be processed of a component main body as a constituent element of a metal component so as to ensure oxidation resistance, the surface treatment method characterized by comprising:

20 an adhering step employing a molded body molded from mixed powders of one or more of an aluminum powder, an aluminum alloy powder, a chromium powder and a chromium alloy powder, or the molded body processed with a heat treatment, as an electrode and generating a pulsing electric discharge between the portion to be processed of the component main body and the electrode in an electrically insulating liquid or gas so that an electrode material of the electrode is adhered to the portion to be processed of the component 25 main body by energy of the electric discharges; and

30 a diffusion step diffusing the adhered electrode material into a base material of the component main body by keeping the portion to be processed of the component main body and the electrode in high temperatures after finishing the adhering step so that a protective coating having oxidation resistance is formed on the portion to be processed of the component main body.

35 [6] The surface treatment method recited in claim 5, characterized in that the metal component is a turbine component applied to a gas turbine engine.

[7] The surface treatment method recited in claim 6,

characterized in that the turbine component is a turbine airfoil.

[8] A metal component characterized by comprising:  
a component main body; and

5 a protective coating having oxidation resistance formed on  
a portion to be processed of the component main body, which is  
composed of SiC,

wherein the protective coating is formed by,  
employing an electrode composed of a molded body molded from  
10 a solid substance of Si and a powder of Si or the molded body processed  
with a heat treatment and generating a pulsing electric discharge  
between the portion to be processed of the component main body  
and the electrode in an electrically insulating liquid including  
an alkane hydrocarbon so that an electrode material of the electrode  
15 or a reaction substance of the electrode material carries out  
deposition, diffusion and/or welding on the portion to be processed  
of the component main body by energy of the electric discharges.

[9] The metal component recited in claim 1 or claim 8,  
20 characterized in that a surface side of the oxidation-resistive  
coating is processed with a peening treatment.

[10] An airfoil component applied to a gas turbine engine or a  
steam turbine engine, the airfoil characterized by comprising:

25 a component main body; and

a protective coating having oxidation resistance formed on  
a portion to be processed of the component main body, which is  
composed of SiC,

wherein the protective coating is formed by,  
30 employing an electrode composed of a molded body molded from  
a solid substance of Si and a powder of Si or the molded body processed  
with a heat treatment and generating a pulsing electric discharge  
between the portion to be processed of the component main body  
and the electrode in an electrically insulating liquid including  
35 an alkane hydrocarbon so that an electrode material of the electrode  
or a reaction substance of the electrode material carries out  
deposition, diffusion and/or welding on the portion to be processed

of the component main body by energy of the electric discharges.

[11] The airfoil component recited in claim 10, characterized in that a surface side of the protective coating is processed with  
5 a peening treatment.

[12] A gas turbine engine characterized by comprising the airfoil component recited in claim 10 or claim 11.

10 [13] A steam turbine engine characterized by comprising the airfoil component recited in claim 10 or claim 11.

[14] A surface treatment method for a surface treatment with respect to a portion to be processed of a component main body as  
15 a constituent element of a metal component so as to ensure oxidation resistance, the surface treatment method characterized by:

employing an electrode composed of a molded body molded from a solid substance of Si and a powder of Si or the molded body processed with a heat treatment and generating a pulsing electric discharge  
20 between the portion to be processed of the component main body and the electrode in an electrically insulating liquid including an alkane hydrocarbon so that an electrode material of the electrode or a reaction substance of the electrode material carries out deposition, diffusion and/or welding on the portion to be processed  
25 of the component main body by energy of the electric discharges.

[15] The surface treatment method recited in claim 14, characterized by processing a surface side of the protective coating with a peening treatment after forming the protective coating.  
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[16] The surface treatment method recited in claim 14 or claim 15, characterized in that the metal component is an airfoil component applied to a gas turbine engine or a steam turbine engine.